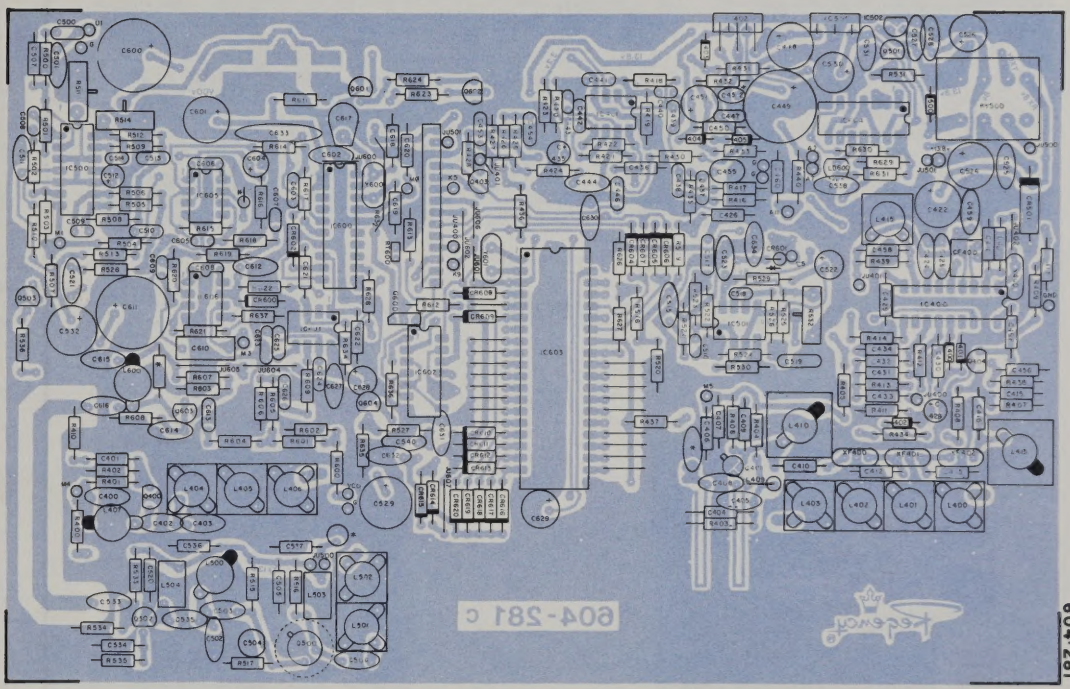
Regency®

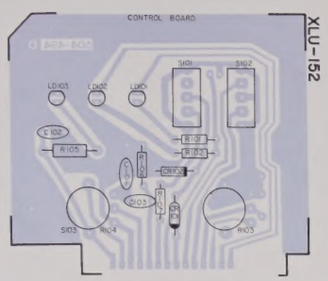
Communications, inc.

XL2000 SERVICE MANUAL



Model XLU152

0300-4216-600



Top Side

Bottom Side

CONTROL BOARD

NO	GENERAL	NOMINAL	GUAR
1	CHANNELS	2	
2	FREQ RANGE	450-482 RANGE 'A' 482-512 RANGE 'B'	
3	OPERATING TEMP	-30°TO+60°C	
4	OPERATING DUTY CYCLE	5 MIN Tx / 15 MIN Rx	
5	SIZE	5 3/4 W x 2 1/8 H x 3 3/4 D	
6	WEIGHT	4-3/4 LBS.	
7	POWER	13.8 V.D.C.	
	CURRENT DRAIN		
8	RCVR SQUELCH	325 MA	
9	RCVR MAX AUDIO	850 MA	
10	TRANSMIT	5A	
11	ANTENNA	50 Ω	
12	CHANNEL SPACING	25 KHZ	

NO	RECEIVER	NOMINAL	GUAR
	SENSITIVITY		
13	20 DB Q		0.5 UV (-113 dBm)
14	12 DB SINAD		0.35 UV (-116 dBm)
	AUDIO SQ SENSITIVITY		
15	THRESHOLD	0.2 UV (-124 dBm)	
16	TIGHT		
17	ETCSS	67 Hz - 250.3 Hz	
18	ADJ CH SEL 20DB		
19	ADJ. CH DESEN 12DB		70 dB
20	OPERATING BANDWIDTH		6 MHz
21	SPURIOUS & IMAGE		70 dB
22	IM 20 DB Q		
23	IM 12 DB SINAD		70 dB
24	BIAS	±7.5 KHZ	
25	FREQ STAB TEMP		± .0005%
26	FREQ STAB VOLTAGE		± .0005%
27	AUDIO RESPONSE	450-3000 Hz	
28	AUDIO OUT PWR (MAX)		

NO	RECEIVER	NOMINAL	GUAR
29	AUDIO OUT PWR (MAX)		5 WATTS @ 5% DIST.
30	SQ BLOCKING		
31	RCVR ATTACK TIME		
32	RCVR SQ CLOSING		
33	HUM & NOISE RATIO	55 dB	
34	UNDESIRED CONDUCTED (AC)		
35	UNDESIRED CONDUCTED (RF)		
36	UNDESIRED RADIATED		F.C.C.
37	HIGH HUMIDITY		
38	VIBRATION STAB		
39	SHOCK STAB		

NO	TRANSMITTER	NOMINAL	GUAR
40	PWR OUTPUT		15 W
41	DC PWR IN TO FINAL		
42	OUT FREQ STAB (TEMP)		±.0005%
43	OUT FREQ STAB (VOLT)		±.0005%
44	SPUR & HARM CONDUCTED		-56 dB
45	SPUR & HARM RADIATED		-56 dB
46	OPERATING BANDWIDTH		6 MHz
47	EMISSION		16F3
48	MODULATION		± 5 KHZ MAX
49	AUDIO FREQ DISTORTION		3%
50	FM HUM & NOISE	40 dB	
51	AM HUM & NOISE		
52	AUDIO FREQ RESPONSE		
53	TRANS CARRIER ATTACK		
54	SIDEBAND SPECTRUM		
55	HIGH HUMIDITY		
56	VIBRATION STABILITY		
57	SHOCK STABILITY		

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE R-578	13 MAY 81	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE ONE PLACE ± .1 TWO PLACE ± .01 ANGLE ± 1° FRACT ± 1/64

	APPROVALS	DATE
DRAWN	ROH	5 MAY 81
ENGINEER		
SPEC SECT		
MFG	TERRA	13 MAY 81

MATERIAL — FINISH

NEXT ASSY: XLU-152 USED ON

APPLICATION — DO NOT SCALE DWG

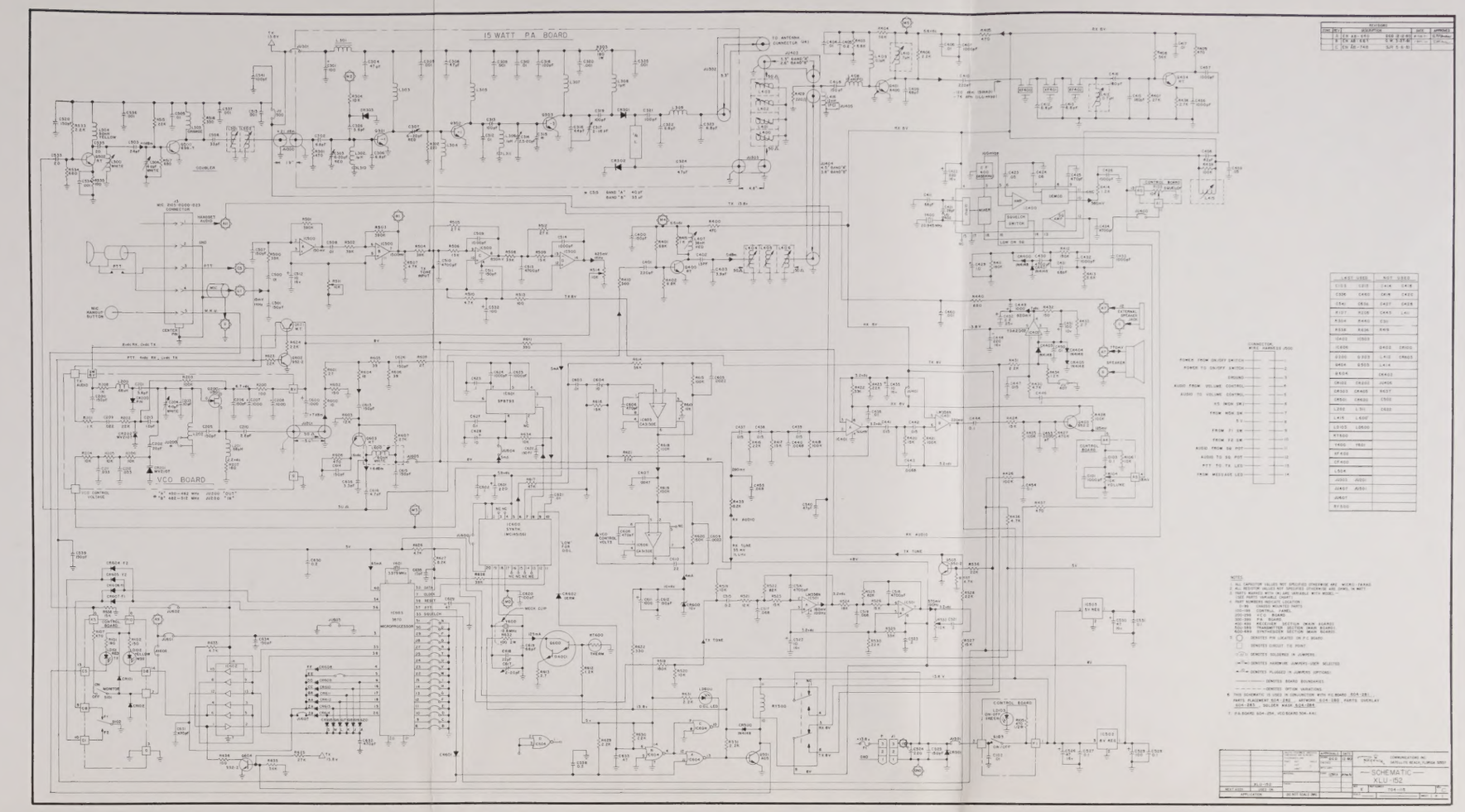
REGENCY COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937

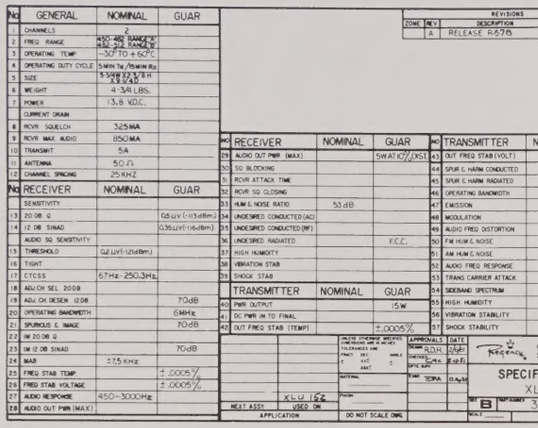
SPECIFICATIONS

XLU152

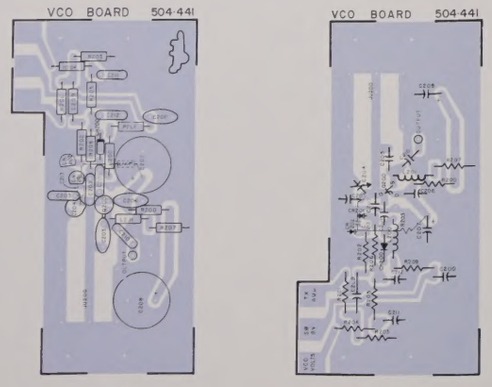
SIZE B | PART NUMBER 304-299 | REV A

SCALE — SHEET 1 OF 1





P. A. BOARD



VCO BOARD

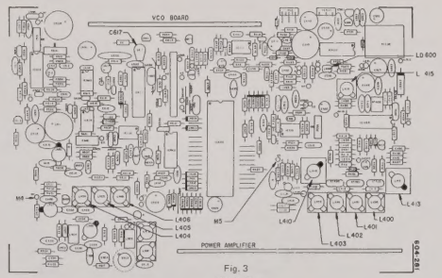
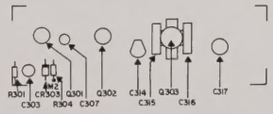


Fig. 3
MAIN BOARD
RECEIVER TUNING POINTS

Fig. 4
TRANSMITTER TUNING POINTS- PA BOARD



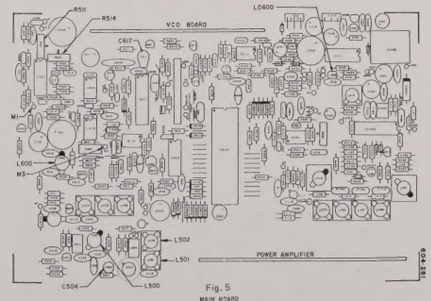
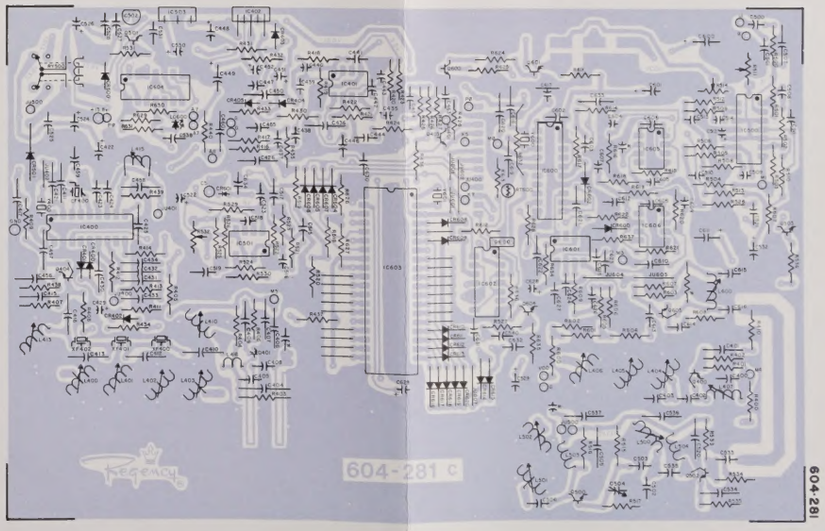


Fig. 5
MAIN BOARD
TRANSMITTER TUNING POINTS



XLU152 - FREQUENCY SET PROCEDURE

XLU152 operating frequency is determined by a series of internal jumper cuts.

The jumper cuts depend on the XLU152 configuration required; for example: (a) 2-channel Simplex, (b) Half Duplex one-channel, Simplex the other channel, etc. Fig. 1 highlights jumper location.

All possible XLU152 configurations are listed in Table A. They include Simplex, ½ Duplex, CTCSS tone, regular or offset channel spacing.

Table B is a listing of all possible XLU152 channel frequencies and their appropriate jumper cuts.

Thus, to set the XLU152 on frequency the following procedure should be observed:

1. Decide on configuration # desired - see Table A.
2. Remove jumpers B and C for the base frequency =450MHz. For two channels, the base frequency must be common to both frequencies.
3. Cut jumper A only for offset frequency operation.
4. Set up 'F1, F2, Y1, Y2, ZA, ZB' jumpers according to Table A.
5. Using Table B, set jumpers 'D-M' to the appropriate channel frequency desired as dictated by Table A (i.e. f1 or f2).
6. Again, use Table B to set jumpers 'N-W' to the appropriate channel frequency desired as dictated by Table A (i.e. f1 or f2).
7. If applicable, set jumpers 'AA-FF' to the appropriate tone frequency desired.

Table C is a listing of all possible XLU152 CTCSS tones available.

EXAMPLE

Channel 1 - Simplex (no CTCSS tone) — $RX_1 = TX_1 = 465.000$ MHz

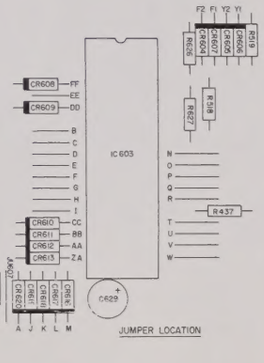
Channel 2 - ½ Duplex with CTCSS tone = 141.3 Hz — $RX_2 =$ 467.000 MHz, $TX_2 =$ 465.000 MHz

a. Using Table A, it is seen that configuration #20 dictates the necessary jumper cuts.
   i.e. F1, Y1, ZA - IN
   F2, Y2, ZB - OUT
   RX_1 (f_1) is set by N-W i.e. 465 MHz
   RX_2 (f_2) is set by D-M i.e. 467 MHz

b. Using Table B, it is seen that the jumper cut sequence for 465 MHz is 1XX1X11XXX with a base frequency of 450 MHz. Thus the jumper cuts are:
   C,B - OUT
   A - IN
   N,Q,S,T - IN
   O,P,R,U,V,W - OUT

c. For 467.000 MHz, it is seen in Table B that the jumper cut sequence is 1X1X1X1XXX. Thus the jumper cuts are:
   D,F,H,J - IN
   E,G,J,K,L,M - OUT

d. Finally, Table C is used to cut 'AA through FF' for 141.3 Hz tone:
   AA,CC,EE,FF - IN
   BB,DD - OUT



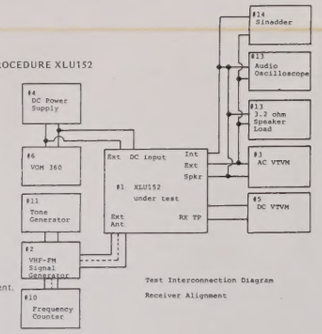
FACTORY TUNE-UP

Before leaving the factory, all radios are tuned and tested in accordance with the following table. This arrangement allows simultaneous testing of receivers and transmitters in the same bandwidth using a minimum number of jumper cuts.

RADIO	TUNE-UP FREQUENCY RX (MHz)	TX (MHz)	ALL JUMPERS ARE IN EXCEPT
XLU152A XLU152B	473.975	475.575	B, C, F1, G

The resultant missing jumpers are supplied in a kit with the radio for use when necessary for custom tune-up.

NOTE: When resetting a custom-tuned radio, it is recommended in the interests of reliability, that the entire jumper be replaced instead of reconnecting an already cut jumper.



Test Interconnection Diagram
Receiver Alignment

FINAL TEST PROCEDURE XLU152

RECEIVER ALIGNMENT

I. Test Set-Up
   A. Equipment
      1. XLU152 Transceiver
      2. UHF FM Signal Generator
      3. AC VTVM
      4. DC Power Supply
      5. DC VTVM or VOM
      6. VOM - Simpson 360 (digital)
      7. Hex Tuning Tool
      8. Small Blade Screwdriver
      9. Small Blade Tuning Tool
      10. Frequency Counter*
      11. Sub-Audible Tone Generator
      12. Audio Oscilloscope
      13. 3.2 ohm Speaker Load
      14. Sinadder or Distortion Meter with 1000 Hz Band Elimination Filter

      * Can be replaced with Cushman or similar equipment.

II. Preset Conditions
   A. Set DC input voltage at +13.8 VDC as measured on DC VOM (#6).
   B. If not already performed, cut appropriate jumpers for desired receive frequency and tone squelch frequency (see frequency setting procedure (TP-14-345).
   C. Preset variable coils, capacitors and helical can screws to positions indicated in Table I.
   D. Set UHF-FM Signal Generator (#2) to CW at the appropriate frequency as measured on Frequency Counter (#10). Set output attenuator to -130dBm (zero output).
   E. Set squelch control (R103) fully CW.
   F. On tone units, set tone monitor switch to monitor position, or unground microphone hang-up button.
   G. Set ON-OFF volume control (R104) fully CCW to OFF. Set channel selector to F1.

III. Tune-Up Procedure (Refer to Figures 1, 2, and 3)
   A. Turn radio 'ON' and set to minimum volume on RX. Note that the Power Supply (#4) current drain is 275 ±50mA.
   B. Connect DC VTVM (#5) between M3 (+) and Gnd (-) and adjust VCO cap, C204, for a reading of 6.5 ± 0.5V. Note that reading must be steady and the 'OUT OF LOCK' LED, LD600, on the main board is extinguished.
   C. Connect DC VTVM (#5) between M4 (+) and Gnd (-). Tune L600 for a minimum voltage reading.
   D. Connect DC VTVM (#5) between M5 (+) and Gnd (-). Tune helicals L404, L405 and L406 for a minimum voltage reading. Then tune L407 for a minimum voltage reading. The reading on DC VTVM should be 6.6 ± 0.3 VDC.
   E. Frequency calibration (not necessary if TX alignment has already been performed) - for exact frequency calibration connect a counter to R533 (See Fig. 3) and adjust C617 (See Fig. 3) for the appropriate LO/2 frequency to within ±100 Hz.
   F. Connect AC VTVM (#3) across the speaker and adjust the ON-OFF volume control for a convenient reference output level on the AC VTVM (#3) on 1V scale.
   G. Set Signal Generator (#2) for 1 KHz tone and ±3 KHz deviation approximately at the level to give 12dB SINAD reading. Tune L415 for maximum reading on AC VTVM (#3). If necessary, re-adjust volume control to maintain the convenient reference level on the 1V scale.
   H. Set Signal Generator (#2) at a level to give approximately 12dB SINAD.
   I. Tune L400, L401, L402, L403, L410, and L413 for the best SINAD reading on AC VTVM (#3). While tuning, decrease the output of the VHF-FM generator to maintain approximately 12dB SINAD.
   J. Repeat Step I. Repeat Step G.
   K. Finally, tune L413 for best 20dB QUIETING input and tune L410 for best 12dB SINAD.
   L. Adjust generator output level until 12dB SINAD is obtained on Meter (#14). The Signal Generator (#2) should read 0.25uv ± .1uv.
   M. Increase Signal Generator (#2) to 1000uv and turn volume control (R104) to full level. AC VTVM (#3) should exceed 3.6V AC.
   N. Remove modulation from Signal Generator (#2) and set it to -130dBm signal level. Set AC VTVM (#3) to 1V scale and use volume control to set voltage on AC VTVM (#3) to 1.0V AC. Increase Signal Generator (#2) until AC VTVM (#3) reads 0.1V AC. This 20dB quieting level should be less than 0.5uv typically 0.4uv.
   O. Reduce the output of Signal Generator (#2) to -130dBm and set squelch control (R103) to threshold just quieting receiver noise. Increase Signal Generator level (#2) until noise appears. This is threshold squelch level and should be less than 0.3uv.
   P. Turn the squelch control (R401) fully counter clockwise and increase the Signal Generator level (#2) until squelch opens again. This is tight squelch and should be less than 1.0uv.
   Q. In 2-channel models, repeat Steps L and N to ascertain performance level. Tune up procedure for 2-channel models is as follows:
   R. RX tune-up for radios with 5 MHz channel spacing -
      1. The tune-up should be performed on the higher frequency channel in the normal manner except for the following:
         VCO voltage - Monitor M3 with DC VTVM (#5) and set C204 for a reading of 7.5 ±0.2V on the higher frequency channel and then check that the reading on the lower frequency channel is not less than 5.0V.
         LO Level - After performing Step IIID, change channel back and forth adjusting L404 for identical readings on DC VTVM (#5) of 6.7 ±0.3V.
         Sensitivity - After measurement of 12dB SINAD in Step L; check 12dB SINAD on the lower frequency channel. The Signal Generator level (#2) should be less than 0.35uv. If not, further adjustment is required. This entails rotating L400 control clockwise but not more than 15°. Recheck SINAD on both channels. If the lower frequency channel is still out of specification, L403 control should be similarly adjusted.
   S. CTCSS Tone Operation - Set S101 in MONITOR position. Repeat Step P. Ground mic hang-up line (Pin 5 of mic. jack). Set S101 (monitor switch) to ALERT position. Check that receiver squelches.
   T. Set generator deviation to ±500 Hz CTCSS tone frequency. Check that receiver unsquelches and LED 102 (yellow message light) turns 'ON'.
   U. Remove modulation from generator. Check that receiver squelches but LED 102 remains 'ON'.
   V. To reset LED 102 (message light), set S101 (monitor switch) to MONITOR position. Check that LED 102 turns 'OFF'.

TABLE A – XLU152 CONFIGURATIONS

S = Simplex
½D = Half Duplex

'A' IN = 25 KHz Ch. Spacing
(T) = With CTCSS Tone

'A' OUT = 12.5 KHz Offset Ch.
* = Optional IN or OUT

Conf. #		CH1	CH2	F1	F2	Y1	Y2	ZA	ZB	D-M	N-W	COMMENTS
1		S	–	IN	IN	IN	IN	OUT*	OUT	*	SET	$RX_1 = TX_1 = f_1$.
2	CHANNEL	S(T)	–	OUT	OUT	IN	IN	IN	IN*	SET	*	"
3		½D	–	OUT	OUT	OUT	OUT	OUT	IN*	RX	TX	$RX_1 = f_1, TX_1 = f_2$.
4		½D(T)	–	OUT	OUT	OUT	OUT	IN	OUT*	RX ($=f_1$)	TX ($=f_2$)	"
5		S	S	OUT	IN	IN	IN	OUT	OUT	CH_1	CH_2	$RX_1=TX_1=f_1$. $RX_2=TX_2=f_2$.
6	CHANNEL	S(T)	S(T)	OUT	IN	IN	IN	IN	IN	CH_1	CH_2	"
7	SIMPLEX	S(T)	S	OUT	IN	IN	IN	IN	OUT	CH_1	CH_2	"
8		S	S(T)	OUT	IN	IN	IN	OUT	IN	CH_1 ($=f_1$)	CH_2 ($=f_2$)	"
9		S	½D	OUT	IN*	IN	OUT	OUT	OUT	f_1	f_2	$RX_1=RX_2=TX_1=f_1$. $TX_2=f_2$.
10	CHANNEL	S(T)	½D(T)	OUT	IN*	IN	OUT	IN	IN	f_1	f_2	
11	½ D/S	S(T)	½D	OUT	IN	IN	OUT	IN	OUT	f_1	f_2	
12	COMMON	S	½D(T)	OUT	IN	IN	OUT	OUT	IN	f_1	f_2	
13	RX.FREQ.	½D	S	IN*	OUT	OUT	IN	OUT	OUT	f_1	f_2	$RX_1=RX_2=TX_2=f_1$.
14		½D(T)	S(T)	IN*	OUT	OUT	IN	IN	IN	f_1	f_2	$TX_1=f_2$.
15		½D(T)	S	IN	OUT	OUT	IN	OUT	IN	f_1	f_2	
16		½D	S(T)	IN	OUT	OUT	IN	IN	OUT	f_1	f_2	
17		S	½D	IN	OUT*	IN	OUT	OUT	OUT	f_2	f_1	$RX_1=TX_1=TX_2=f_1$.
18	CHANNEL	S(T)	½D(T)	IN	OUT*	IN	OUT	IN	IN	f_2	f_1	$RX_2=f_2$.
19	½D/S	S(T)	½D	IN	OUT	IN	OUT	OUT	IN	f_2	f_1	
20	COMMON	S	½D(T)	IN	OUT	IN	OUT	IN	OUT	f_2	f_1	
21	TX.FREQ.	½D	S	OUT*	IN	OUT	IN	OUT	OUT	f_2	f_1	$RX_2=TX_2=TX_1=f_1$.
22		½D(T)	S(T)	OUT*	IN	OUT	IN	IN	IN	f_2	f_1	$RX_1=f_2$.
23	½D/S	S(T)	½D	OUT	IN	OUT	IN	OUT	IN	f_2	f_1	"
24	COMMON	½D(T)	S	OUT	IN	OUT	IN	IN	OUT	f_2	f_1	

TABLE B

XLU 152 JUMPER CUT CHART — NOTE 'A' OUT IS .0125 HIGHER THAN 'A' JUMPER IN

X=CUT 1=LEAVE IN — BASE FREQ.=450 MHZ — 'B' OUT, 'C' OUT

'A' IN (MHZ)	JUMPERS: CH f DEFGHIJKLM NOPQRSTUVW								
450.000	XXXXXXXXXX	450.550	XXXXX1X11X	451.175	XXXX1X1111	451.800	XXX1XX1XXX
450.025	XXXXXX111X	450.575	XXXXX1X111	451.200	XXXX11XXXX	451.825	XXX1XX1XX1
450.050	XXXXXXX1X	450.600	XXXXX11XXX	451.225	XXXX11XXX1	451.850	XXX1XX1X1X
450.075	XXXXXXX11	450.625	XXXXX11XX1	451.250	XXXX11X1XX	451.875	XXX1XX1X11
450.100	XXXXXX1XX	450.650	XXXXX11X1X	451.275	XXXX11X11X	451.900	XXX1XX11XX
450.125	XXXXXX1X1	450.675	XXXXX11X11	451.300	XXXX11X1XX	451.925	XXX1XX11X1
450.150	XXXXXX11X	450.700	XXXXX111XX	451.325	XXXX11X1X1	451.950	XXX1XX11X11
450.175	XXXXXX111	450.725	XXXXX1111X	451.350	XXXX11X11X	451.975	XXX1XX111XX
450.200	XXXXX1X1XX	450.750	XXXXX1111X	451.375	XXXX11X111	452.000	XXX1XX111X1
450.225	XXXXX1X1X1	450.775	XXXXX11111	451.400	XXXX111XXX	452.025	XXX1X1XXX1
450.250	XXXXX1X1X	450.800	XXXX1XXXXX	451.425	XXXX111XX1	452.050	XXX1X1XX1X
450.275	XXXXX1X11X	450.825	XXXX1XXXX1	451.450	XXXX111X1X	452.075	XXX1X1XX11
450.300	XXXXX11XXX	450.850	XXXX1XXX1X	451.475	XXXX111X11	452.100	XXX1X1X1XX
450.325	XXXXX11X1	450.875	XXXX1XXX11	451.500	XXXX1111XX	452.125	XXX1X1X1X1
450.350	XXXXX11X1X	450.900	XXXX1XX1XX	451.525	XXXX1111X1	452.150	XXX1X1X11X
450.375	XXXXX11X11	450.925	XXXX1XX1X1	451.550	XXXX11111X	452.175	XXX1X1X111
450.400	XXXXX1XX1X	450.950	XXXX1XX11X	451.575	XXXX111111	452.200	XXX1X11XXX
450.425	XXXXX1XX11	450.975	XXXX1XX111	451.600	XXX1XXXXXX	452.225	XXX1X11X1X
450.450	XXXXX1XX1X	451.000	XXXX1X1XXX	451.625	XXX1XXXXX1	452.250	XXX1X11X1X
450.475	XXXXX1X1X1	451.025	XXXX1X1X1X	451.650	XXX1XXXX1X	452.275	XXX1X11X11
450.500	XXXXX1X1XX	451.050	XXXX1X1X1X	451.675	XXX1XXXX11	452.300	XXX1X111XX
450.525	XXXXX1X1X1	451.075	XXXX1X1X11	451.700	XXX1XXX1XX	452.325	XXX1X111X1
		451.100	XXXX1X11XX	451.725	XXX1XXX1X1	452.350	XXX1X1111X
		451.125	XXXX1X11X1	451.750	XXX1XXX11X	452.375	XXX1X11111
		451.150	XXXX1X111X	451.775	XXX1XXX111	452.400	XXX11XXXXX

452.425	XXX11XXXX1	454.850	XX11XXXX1X	457.275	X1XX1XXX11	459.700	X11XXXX1XX
452.450	XXX11XXX1X	454.875	XX11XXXX11	457.300	X1XX1XXX1X	459.725	X11XXXX1X1
452.475	XXX11XXX11	454.900	XX11XXX1XX	457.325	X1XX1XXX1X1	459.750	X11XXXX11X
452.500	XXX11XX1XX	454.925	XX11XXX1X1	457.350	X1XX1XXX11X	459.775	X11XXXX111
452.525	XXX11XX1X1	454.950	XX11XXX11X	457.375	X1XX1XXX111	459.800	X11XXX1XXX
452.550	XXX11XX11X	454.975	XX11XXX111	457.400	X1XX1X1XXX	459.825	X11XXX1XX1
452.575	XXX11XX111	455.000	XX11X1XXXX	457.425	X1XX1X1XX1	459.850	X11XXX1X1X
452.600	XXX11X1XXX	455.025	XX11X1XXX1	457.450	X1XX1X1X1X	459.875	X11XXX1X11
452.625	XXX11X1XX1	455.050	XX11X1XX1X	457.475	X1XX1X1X11	459.900	X11XXX11XX
452.650	XXX11X1X1X	455.075	XX11X1X11X	457.500	X1XX11X11X	459.925	X11XXX11X1
452.675	XXX11X1X11	455.100	XX11X11XXX	457.525	X1XX11X1X1	459.950	X11XXX11X11
452.700	XXX11X11XX	455.125	XX11X11XX1	457.550	X1XX11X11X	459.975	X11XXX111XX
452.725	XXX11X11X1	455.150	XX11X11X1X	457.575	X1XX11X111	460.000	X11XX1XXXX
452.750	XXX11X11X	455.175	XX11X11X11	457.600	X1XX11XXXX	460.025	X11XX1XXX1
452.775	XXX11X111	455.200	XX11X1XXXX	457.625	X1XX11XXX1	460.050	X11XX1XX1X
452.800	XXX111XXXX	455.225	XX11X1XXX1	457.650	X1XX11XX1X	460.075	X11XX1X1XX
452.825	XXX111XXX1	455.250	XX11X1XX1X	457.675	X1XX11X11X	460.100	X11XX1X1X1
452.850	XXX111XX1X	455.275	XX11X1X1X1	457.700	X1XX11X1X1	460.125	X11XX1X11X
452.875	XXX111XX11	455.300	XX11X1X11X	457.725	X1XX11X11X	460.150	X11XX1X111
452.900	XXX111X1XX	455.325	XX11X1X1X1	457.750	X1XX11X111X	460.175	X11XX11XXX
452.925	XXX111X1X1	455.350	XX11X1X11X	457.775	X1XX11X1111	460.200	X11XX11XX1
452.950	XXX111X11X	455.375	XX11X1X111	457.800	X1XX111XXX	460.225	X11XX11X1X
452.975	XXX111X111	455.400	XX11X11XXX	457.825	X1XX111XX1	460.250	X11XX11X11
453.000	XXX1111XXX	455.425	XX11X11XX1	457.850	X1XX111X1X	460.275	X11XX11X1X
453.025	XXX1111XX1	455.450	XX11X11X1X	457.875	X1XX111X11	460.300	X11XX11X11
453.050	XXX1111X1X	455.475	XX11X11X11	457.900	X1XX111X1X	460.325	X11XX11X1X
453.075	XXX1111X11	455.500	XX11X111XX	457.925	X1XX111X11	460.350	X11XX11X11
453.100	XXX11111XX	455.525	XX11X111X1	457.950	X1XX111111	460.400	X11XX111XX
453.125	XXX11111X1	455.550	XX11X111X1	457.975	X1XX1111X1	460.425	X11XX111X1
453.150	XXX11111X	455.575	XX11X11111	458.000	X1X1XXXXXX	460.450	X11XX111X1X
453.175	XXX1111111	455.600	XX111XXXXX	458.025	X1X1XXXXX1	460.475	X11XX111X11
453.200	XX1XXXXXXX	455.625	XX111XXXX1	458.050	X1X1XXXX1X	460.500	X11XX1111XX
453.225	XX1XXXXX1X	455.650	XX111XXX1X	458.075	X1X1XXXX11	460.525	X11XX1111X1
453.250	XX1XXXXX11	455.675	XX111XXX11	458.100	X1X1XXX1XX	460.550	X11XX1111X
453.275	XX1XXXXX11	455.700	XX111X1X1X	458.125	X1X1XXX1X1	460.575	X11XX11111
453.300	XX1XXXX1XX	455.725	XX111X1X11	458.150	X1X1XXX11X	460.600	X11X1XXXX
453.325	XX1XXXX1X1	455.750	XX111X11XX	458.175	X1X1XXX111	460.625	X11X1XXX1
453.350	XX1XXXX11X	455.775	XX111X11X1	458.200	X1X1X1XXXX	460.650	X11X1XX1X
453.375	XX1XXXX111	455.800	XX111X1XXX	458.225	X1X1X1XXX1	460.675	X11X1XX11X
453.400	XX1XXX1XXX	455.825	XX111X1X1X	458.250	X1X1X1XX1X	460.700	X11X1X1XXX
453.425	XX1XXX1XX1	455.850	XX111X1X1X	458.275	X1X1X1XX11	460.725	X11X1X1X1X
453.450	XX1XXX1X1X	455.875	XX111X1X11	458.300	X1X1X11XXX	460.750	X11X1X1X11
453.475	XX1XXX1X11	455.900	XX111X11XX	458.325	X1X1X11XX1	460.775	X11X1X1111
453.500	XX1XXX11XX	455.925	XX111X11X1	458.350	X1X1X11X1X	460.800	X11X11XXXX
453.525	XX1XXX11X1	455.950	XX111X111X	458.375	X1X1X11X11	460.825	X11X11XXX1
453.550	XX1XXX111X	455.975	XX111X1111	458.400	X1X1X111XX	460.850	X11X11XX1X
453.575	XX1XXX1111	456.000	XX1111XXXX	458.425	X1X1X111X1	460.875	X11X11XX11
453.600	XX1XX1XXXX	456.025	XX1111XXX1	458.450	X1X1X111X1X	460.900	X11X11X1XX
453.625	XX1XX1XXX1	456.050	XX1111X1XX	458.475	X1X1X111X11	460.925	X11X11X1X1
453.650	XX1XX1XX1X	456.075	XX1111X1X1	458.500	X1X1X1111XX	460.950	X11X11X11X
453.675	XX1XX1XX11	456.100	XX1111X11X	458.525	X1X1X1111X1	460.975	X11X11X111
453.700	XX1XX1X1XX	456.125	XX1111X1X1	458.550	X1X1X1111X1	461.000	X11X111XXX
453.725	XX1XX1X1X1	456.150	XX1111X11X	458.575	X1X1X11111X	461.025	X11X111XX1
453.750	XX1XX1X11X	456.175	XX1111X111	458.600	X1X1X11XXX	461.050	X11X111X1X
453.775	XX1XX1X111	456.200	XX11111XXX	458.625	X1X1X11XX1	461.075	X11X111X11
453.800	XX1XX11XXX	456.225	XX11111XX1	458.650	X1X1X11X1X	461.100	X11X1111XX
453.825	XX1XX11XX1	456.250	XX11111X1X	458.675	X1X1X11X11	461.125	X11X1111X1
453.850	XX1XX11X1X	456.275	XX11111X11	458.700	X1X1X111XX	461.150	X11X1111X
453.875	XX1XX11X11	456.300	XX1111111X	458.725	X1X1X111X1	461.175	X11X11111
453.900	XX1XX111XX	456.325	XX1111111X	458.750	X1X1X1111X	461.200	X11XXXXXX
453.925	XX1XX111X1	456.350	XX11111111	458.775	X1X1X11111	461.225	X11XXXXX1
453.950	XX1XX1111X	456.375	X11111111X	458.800	X1X11XXXXX	461.250	X11XXXX1X
453.975	XX1XX11111	456.400	X1XXXXXXXX	458.825	X1X11XXXX1	461.275	X11XXXX1X1
454.000	XX1X1XXXXX	456.425	X1XXXXXXX1	458.850	X1X11XXX1X	461.300	X11XXX1XXX
454.025	XX1X1XXXX1	456.450	X1XXXXXX1X	458.875	X1X11XXX11	461.325	X11XXX1X1X
454.050	XX1X1XXX1X	456.475	X1XXXXXX11	458.900	X1X11XX1XX	461.350	X11XXX1X11
454.075	XX1X1XXX11	456.500	X1XXXXX1XX	458.925	X1X11XX1X1	461.375	X11XXX111X
454.100	XX1X1XX1XX	456.525	X1XXXXX1X1	458.950	X1X11XX11X	461.400	X11XX1XXXX
454.125	XX1X1XX1X1	456.550	X1XXXXX11X	458.975	X1X11XX111	461.425	X11XX1XXX1
454.150	XX1X1XX1X	456.575	X1XXXXX111	459.000	X1X11X1XXX	461.450	X11XX1XX1X
454.175	XX1X1XX111	456.600	X1XXXX1XXX	459.025	X1X11X1XX1	461.475	X11XX1XX11
454.200	XX1X1X1XXX	456.625	X1XXXX1XX1	459.050	X1X11X1X1X	461.500	X11XX1X1XX
454.225	XX1X1X1XX1	456.650	X1XXXX1X1X	459.075	X1X11X1X11	461.525	X11XX1X1X1
454.250	XX1X1X1X1X	456.675	X1XXXX1X11	459.100	X1X11X11XX	461.550	X11XX1X11X
454.275	XX1X1X1X11	456.700	X1XXXX11XX	459.125	X1X11X11X1	461.575	X11XX1X111
454.300	XX1X1X11XX	456.725	X1XXXX11X1	459.150	X1X11X11X1	461.600	X11XX11XXX
454.325	XX1X1X11X1	456.750	X1XXXX11X1	459.175	X1X11X111X	461.625	X11XX11XX1
454.350	XX1X1X111X	456.775	X1XXXX1111	459.200	X1X111XXXX	461.650	X11XX11X1X
454.375	XX1X1X1111	456.800	X1XXX1XXXX	459.225	X1X111XXX1	461.675	X11XX11X11
454.400	XX1X11XXXX	456.825	X1XXX1XXX1	459.250	X1X111XX1X	461.700	X11XX111XX
454.425	XX1X11XXX1	456.850	X1XXX1XX1X	459.275	X1X111X1X1	461.725	X11XX111X1
454.450	XX1X11XX1X	456.875	X1XXX1XX11	459.300	X1X111X1XX	461.750	X11XX1111X
454.475	XX1X11X1XX	456.900	X1XXX1X1XX	459.325	X1X111X1X1	461.775	X11XX11111
454.500	XX1X11X1X1	456.925	X1XXX1X1X1	459.350	X1X111X11X	461.800	X11X1XXXX
454.525	XX1X11X11X	456.950	X1XXX1X11X	459.375	X1X111X111	461.825	X11X1XXX1
454.550	XX1X11X111	456.975	X1XXX1X111	459.400	X1X1111XXX	461.850	X11X1XX1X
454.575	XX1X111XXX	457.000	X1XXX11XX1	459.425	X1X1111X1X	461.875	X11X1XX11
454.600	XX1X111XX1	457.025	X1XXX11X1X	459.450	X1X1111X11	461.900	X11X1X1XX
454.625	XX1X111X1X	457.050	X1XXX11X1X	459.475	X1X1111X1X	461.925	X11X1X1X1
454.650	XX1X111X11	457.075	X1XXX11X11	459.500	X1X1111XXX	461.950	X11X1X11X
454.675	XX1X111X1X	457.100	X1XXX111XX	459.525	X1X11111X1	461.975	X11X1X111
454.700	XX1X111X11	457.125	X1XXX111X1	459.550	X1X11111X1	462.000	X111XXXXX
454.725	XX1X111X1X	457.150	X1XXX111X1	459.575	X1X11111X1	462.025	X111XXXX1
454.750	XX1X111111X	457.175	X1XXX11111	459.600	X11XXXXXXX	462.025	X111XXXX1
454.775	XX1X1111111	457.200	X1X1XXXXXX	459.625	X11XXXXXX1	462.050	X111XXX1X
454.800	XX11XXXXXX	457.225	X1X1XXXXX1	459.650	X11XXXXX1X	462.075	X111XXX11
454.825	XX11XXXXX1	457.250	X1X1XXXX1X	459.675	X11XXXXX11	462.100	X1111XX1XX

462.125	X1111X1X1X	464.550	1XX1XXX11X	466.950	1X1X1X11XX	469.350	11XXXXX11X
462.150	X1111X11XX	464.575	1XX1XXX111	466.975	1X1X1X111X	469.375	11XXXXX111
462.175	X1111X1111	464.600	1XX1XX1XXX	467.000	1X1X1XXXXX	469.400	11XXXX1XXX
462.200	X1111X1XXX	464.625	1XX1XX1XX1	467.025	1X1X1X1XX1	469.425	11XXXX1XX1
462.225	X1111X1X1X	464.650	1XX1XX1X1X	467.050	1X1X1X1X1X	469.450	11XXXX1X1X
462.250	X1111X1X11	464.675	1XX1XX1X11	467.075	1X1X1X11XX	469.475	11XXXX11X1
462.275	X1111X1X11	464.700	1XX1XX11XX	467.100	1X1X1X11X1	469.500	11XXXX11XX
462.300	X1111X11XX	464.725	1XX1XX11X1	467.125	1X1X1X11X1	469.525	11XXXX11X1
462.325	X1111X11X1	464.750	1XX1XX11X1	467.150	1X1X1X11X1	469.550	11XXXX111X
462.350	X1111X111X	464.775	1XX1XX1111	467.175	1X1X1X1111	469.575	11XXXX1111
462.375	X1111X1111	464.800	1XX1XX1XXX	467.200	1X1X11XXXX	469.600	11XXX1XXXX
462.400	X1111XXXXX	464.825	1XX1XX1XX1	467.225	1X1X11XXX1	469.625	11XXX1XXX1
462.425	X1111XXXX1	464.850	1XX1XX1X1X	467.250	1X1X11XX1X	469.650	11XXX1XX1X
462.450	X1111XX1XX	464.875	1XX1XX1X11	467.275	1X1X11XX11	469.675	11XXX1X1XX
462.475	X1111XX1X1	464.900	1XX1XX1XXX	467.300	1X1X11X1XX	469.700	11XXX1X1X1
462.500	X1111XX11X	464.925	1XX1XX1X1X	467.325	1X1X11X1X1	469.725	11XXX1X1X1
462.525	X1111XX111	464.950	1XX1XX1X11	467.350	1X1X11X11X	469.750	11XXX1X11X
462.550	X1111X1XXX	464.975	1XX1XX1111	467.375	1X1X11X111	469.775	11XXX1X111
462.575	X1111X1X1X	465.000	1XX1X11XXX	467.400	1X1X1XXXXX	469.800	11XXX11XXX
462.600	X1111X11XX	465.025	1XX1X11XX1	467.425	1X1X1XXXX1	469.825	11XXX11XX1
462.625	X1111X11X1	465.050	1XX1X11X1X	467.450	1X1X11X1XX	469.850	11XXX11X1X
462.650	X1111X111X	465.075	1XX1X11X11	467.475	1X1X11X1X1	469.875	11XXX11X11
462.675	X1111X1111	465.100	1XX1X111XX	467.500	1X1X11X11X	469.900	11XXX111XX
462.700	X11111111X	465.125	1XX1X111X1	467.525	1X1X11X111	469.925	11XXX111X1
462.725	X1111111X1	465.150	1XX1X1111X	467.550	1X1X111111	469.950	11XXX1111X
462.750	X1111111X	465.175	1XX1X11111	467.575	1X1X1111X1	469.975	11XXX11111
462.775	X1111111111	465.200	1XX1XXXXXX	467.600	1X11XXXXXX	470.000	11XXX1XXXX
462.800	1

M. DC VTVM (#2) should read 13.8 VDC. Cool thermistor RT501 below 0^0C. DC VTVM (#2) should read less than 2V and crystal heater resistor R632 should begin to heat.

N. DC VTVM should read 13.8 VDC when RT501 warms to 15^0C.

IV. TABLE OF PERFORMANCE LIMITS

PARAMETER	MIN	TYP	MAX	UNITS
M3	4.5	6.5	8.5	VDC
M2	2.5		4.0	VDC
TX Power Output	15.0	17		Watts
Mic Mod Input		26	40	mVrms
Deviation	-	-	± 5.0	KHz
TX Freq. Error		± 100		Hz
Tone Deviation		± 500		Hz
TX Current	-	3.5	± 5.0	Amps
Second Harmonic	56	60	-	dB

2. Key transmitter. The voltage at M3 should be less than 8.5 VDC and the 'OUT OF LOCK' LED, LD600, on the main board should not be on. If it is on, the loop is not locked and the transmitter will not transmit (or the receiver receive on the proper frequency). Adjust C204 so that the M3 voltage is less than 8.5 VDC.

B. Tune exciter and power amplifier.
1. Connect DC VTVM (#2) between M2 (+) and Gnd (-) and set to 10 VDC scale. Tune L501 and L502 for maximum positive voltage on M2. Then tune C303 on the power amplifier, C504 and L500 for maximum voltage. Readjust L501 and L502 for maximum voltage. Voltage should be in range 2.5 - 4.0 VDC when peaked.
2. Monitor output wattmeter (#8) and tune the following trimmer capacitors for maximum power: C317, C314, C307. Retune C317 for maximum power. Output power must exceed 15W. Repeat B1.

C. Tuning instructions if high and low transmitter frequency exceeds 1.5 MHz.
1. Set VCO control voltage. Connect DC VTVM (#2) to M3 on 10 VDC scale. Monitor M3. Key and unkey the transmitter on both F1 and F2. The voltage must remain in the range 4.0 to 8.5 VDC. Readjust C204 if the voltage fell out of this range.
2. Tune the exciter while monitoring M2. On both F1 and F2 tune L501 and L502; then tune C303, C504, and L500 for identical maximum voltage readings.
3. While monitoring output power tune C314, C317, and C307 for the best compromise in power on each channel.

D. Set the spectrum analyzer (#9) and the band reject filter (#13) for maximum carrier indication on the 0dB reference line. Attenuate the carrier with the band reject filter (#13) a minimum of 30dB. Check for 2nd harmonic level on the spectrum analyzer (#9). The 2nd harmonic should be greater than 56dB down. Check also ½ harmonic level (VCO frequency). This should also be greater than 56dB down.

E. Check input current to the transceiver on the DC power supply (#3). This level should not exceed 5 amps.

F1. Connect the counter (#11) to the output of the pad (#8) and set C617 (see Figure 5) for the nominal frequency ± 100 Hz as per Section IIF.

F2. Unkey transmitter.

G. Adjust deviation pot, R514, to center position and adjust tone deviation pot, R532, to minimum output position, fully clockwise when facing the front of the transceiver.

B. **Test Interconnection Diagram**

Transmitter Tests

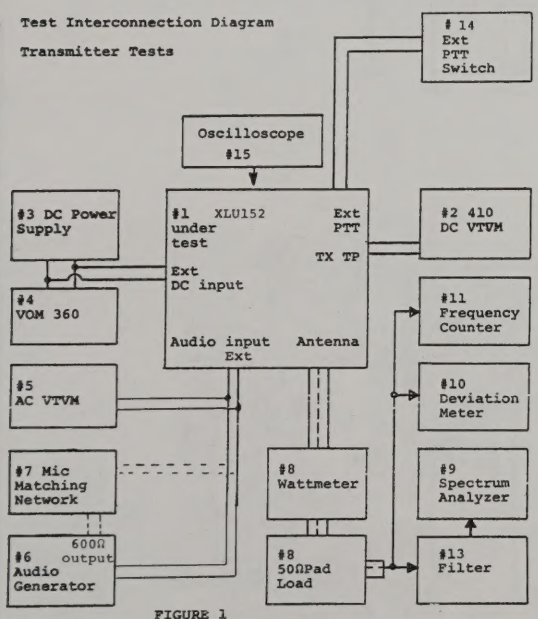


FIGURE 1

MICROPHONE MATCHING NETWORK

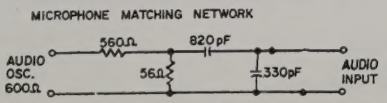


TABLE C - C.T.C.S.S. TONES

X = CUT, 1 = LEAVE IN

HERTZ	AA	BB	CC	DD	EE	FF
67.00	1	1	1	1	1	1
71.90	1	1	1	1	1	X
74.40	1	1	1	1	X	1
77.00	1	1	1	1	X	X
79.70	1	1	1	X	1	1
82.50	1	1	1	X	1	X
85.40	1	1	1	X	X	1
88.50	1	1	1	X	X	X
91.50	1	1	X	1	1	1
94.80	1	1	X	1	1	X
100.0	1	1	X	1	X	1
103.5	1	1	X	1	X	X
107.2	1	1	X	X	1	1
110.9	1	1	X	X	1	X
114.8	1	1	X	X	X	1
118.8	1	1	X	X	X	X
123.0	1	X	1	1	1	1
127.3	1	X	1	1	1	X
131.8	1	X	1	1	X	1
136.5	1	X	1	1	X	X
141.3	1	X	1	X	1	1
146.2	1	X	1	X	1	X
151.4	1	X	1	X	X	1
156.7	1	X	1	X	X	X
162.2	1	X	X	1	1	1
167.9	1	X	X	1	1	X
173.8	1	X	X	1	X	1
179.9	1	X	X	1	X	X
186.2	1	X	X	X	1	1
192.8	1	X	X	X	1	X
203.5	1	X	X	X	X	1
210.7	1	X	X	X	X	X
218.1	X	1	1	1	1	1
225.7	X	1	1	1	1	X
233.6	X	1	1	1	X	1
241.8	X	1	1	1	X	X
250.3	X	1	1	X	1	1